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COMPUTER NETWORKS -- THE PATH TO A UNIFIED SYSTEM

Riga SOVETSKAYA LATVIYA in Russian 28 Apr 78 p 3

[Interview with Academician Boris Nikolayevich Petrov by S. Il'icheva]

[Text] The Latvian SSR Academy of Sciences' Institute of Electronics and Computer Technology, in Riga, was the site of a recent conference of vice presidents of the USSR Academy of Sciences and the union republics' Academies of Sciences, as well as representatives of the principal designers of computer technology for USSR ministries and departments. The conference was devoted to a discussion of the prospects for the development of computer networks and computer systems for collective use in the union republics' Academies of Sciences and the various centers of the USSR Academy of Sciences.

On behalf of the Presidium of the USSR Academy of Sciences, the conference worked under the leadership of Academician B.N. Petrov.

Our correspondent, S. Il'icheva, interviewed Academician Petrov.

[Question] Boris Nikolayevich, I would like to ask you several questions in your capacities as academician-secretary of the USSR Academy of Sciences' Department of Mechanics and Control Processes and chairman of the "Interkosmos" council.

What is the significance of this conference, and for what reason was it held in Riga?

[Answer] The department that I head is concerned with scientific questions related to the further improvement of computer

technology. The decisions of the 25th CPSU Congress stipulate substantial development work in computer technology and an increase in the efficiency with which computer facilities are used. The goal is formulated in the Basic Directions for the Development of the USSR's National Economy for 1976-1980: "To insure the further development and an increase in the efficiency of automated control system and computer centers, by gradually combining them into a unified, Statewide system for collecting and processing information for accounting, planning and administrative purposes. To create computer centers for collective use."

The Presidium of the USSR Academy of Sciences considers it a matter of particular importance to develop basic research in the field of computer technology. At the present time a complex of measures is being developed that should insure the implementation of the program for increasing the efficiency of computer utilization and the conduct of research on the development of new generations of electronic computers and their elements. One of the most important goals in this area is the development of computer networks and collective-use systems as the most rational way to use computer technology in the national economy. Instead of setting up numerous computer complexes in each individual organization and institute, it is more advisable to concentrate the basic computational facilities in large computer centers and allow their resources to be used through subscriber points and minimachine terminals over communication links. This is why the appearance of highly productive computers and the enlargement of their capabilities has made the problem of creating computer centers and collective-use systems and networks an urgent one.

As a rule, collective-use computer centers have a hierarchical system and several levels of computational facilities. On the upper level we find the high-productivity computers such as the YeS-1050 and YeS-1035 types, while on the lower level we find minicomputers that are usually distributed to the users. The establishments of the various academies of sciences are creating computer systems in which minicomputers are placed in institutes and laboratories and are connected to a powerful computer or a computer complex consisting of several computers. This enables all of the subscribers of a collective-use system to not only carry out all of their necessary calculations and computations, but also provides for automation of scientific research, planning, and other processes.

The experimental computer center of the Latvian SSR Academy of Sciences can serve as an example of such a collective-use system. Under the leadership of Latvian SSR Academy of Sciences'

Academician E.A. Yakubaytis, it was developed by a collective from the Institute of Electronics and Computer Technology, where we are guests today.

An even greater goal is the creation of computer networks that will unite the various computer centers located in different cities in our country. This is the path to the creation of a Statewide information collection and processing system.

Computer networks make it possible not only to increase the productivity of computer facilities, but also to attain a new qualitative level in the use of computer technology. For example, there is much of value in the exchange of computer programs developed for different purposes, as well as the exchange of large data bases. For instance, a data base for the spectral investigation of different substances has been created in Novosibirsk. All subscribers of different scientific centers throughout the country an use these data.

The choice of the institute here as the site of this conference was not a random one. It has already achieved important results in the creation of a collective-use computer system. The experimental system of the republic's Academy of Sciences was developed here. It consists of two series YeS-1030 computers and two M-4030 computers (one of which is the so-called dispatching unit), as well as a number of terminal units (or computational complexes) that are placed in the various institutes. This system was created on the basis of progressive ideas that were developed at the institute, which has already accumulated experience in operating this local computer network. There are also experimental exchanges of information with several computer centers located in different cities and even in different countries.

Those who attended the conference were able to acquaint themselves with this system of the Latvian Academy of Sciences and the scientific research work that is being done in the institute's laboratories. The conference, at which we heard reports from leading specialists in this field who work at various scientific centers, gave all its participants a chance to become familiar with the latest achievements in the field of creating collective-use computer networks.

[Question] Boris Nikolayevich, at the press conference that was held in Moscow State University's assembly hall on 11 April for the purpose of reporting the results of the extended space expedition in the Salyut-6 station, you said that the flight of A. Gubarev and V. Remek from Czechoslovakia -- the first international crew -- had opened a new stage in the development of

cooperation among the socialist countries participating in the Interkosmos program. Please tell us about the prospects for this collaboration.

[Answer] As you know, nine countries in the fraternal socialist collaboration -- Bulgaria, Hungary, the GDR, Cuba, Mongolia, Poland, Romania, the USSR, and Czechoslovakia -- are working together in the Interkosmos program. Right now this collaboration is actually going through a new stage. We are already using a new generation of Interkosmos-series satellites; these are the so-called automatic, general-purpose orbital stations. The Interkosmos-17 satellite belongs to this generation. Such stations make it possible to conduct more complex and extended experiments in space.

We have also built a new generation of geophysical rockets of the Vertikal' type. The Vertikal'-6 has already lifted investigative equipment to an altitude of about 1,500 kilometers. While descending under a parachute, these instruments made a series of measurements that gave us a "vertical profile" of the atmosphere.

The flight of the first international crew in a Soviet spaceship and orbital station was, of course, a great event. The first group of cosmonaut candidates included citizens of Czechoslovakia, Poland and the GDR. One special feature of our most recent experiments in space was the development of a research program with the participation of scientists from other socialist countries. It was, naturally, coordinated with the program that was carried out by the basic crew of the orbital complex formed by the Salyut-6 and the Soyuz.

At the present time, cosmonaut candidates from Poland and the GDR are completing their training at the Cosmonaut Training Center imeni Yu.A. Gagarin. Candidates from five more countries (Bulgaria, Hungary, Cuba, Mongolia, and Rumania) have also started training at Zvezdnyy Gorodok. The flight of the next crews in Soyuz spaceships and the Salyut-6--Soyuz orbital complex is being planned.

Preparations are continuing for experiments for the Interkosmos series of satellites, as well as on the next biological satellite in the Kosmos series. As you know, the research performed by the Kosmos-936 biological satellite was of an international nature. In addition to Soviet instruments, the satellite also carried equipment produced in Czechoslovakia, France and the United States. There was substantial interest in the experiments with test animals, with particular emphasis on the creation of artificial gravity. Here we compared the results of

the flights of two groups of animals, one of which was carried out under artificial gravity conditions, while the other was conducted under conditions of weightlessness.

The Interkosmos program also includes many other interesting and important experiments.

[Question] What impressions are you left with after meeting with your colleagues from Latvia?

[Answer] First of all, I must congratulate the workers of socialist Latvia on the new constitution that was recently adopted by the republic's Supreme Soviet. This event will be yet another stimulus for the creative research being done by the scientists of the Latvian SSR Academy of Sciences. They are laboring in the most promising areas of modern science. I have met many of them at scientific meetings in Moscow and at international meetings and conferences. And the conference that just ended here in Riga was a great event for the prospective development of computer networks and collective-use computer systems.

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CSO: 1870

USE OF COMPUTER TECHNOLOGY IN THE NATIONAL ECONOMY DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 78 p 6

[Interview with Dmitriy Georgiyevich Zhimerin, first deputy chairman of the USSR Council of Ministers' State Committee for Science and Technology: "A Qualitatively New Stage"]

[Text] The Second All-Union Conference on the Use of Computer Technology and Automated Control Systems in the National Economy will be held in Moscow in May. The editors of EKONOMICHESKAYA GAZETA turned to D.G. Zhimerin, first deputy chairman of the USSR Council of Ministers' State Committee for Science and Technology, with a request that he tell us about the goals of the conference and what has been done in this area since the First All-Union Conference, which was held in January 1972. Below, we publish the interview.

[Question] Dmitriy Georgiyevich, 6 years have passed since the first of these conferences. What has been done in the area of improving the efficiency of utilization of ASU's [automated control systems] in the national economy?

[Answer] During this time, a great deal has been done in our country. First, there has been a substantial increase in the number of ASU's for different purposes. At the beginning of this year, almost 3,500 of them were in use. The quality of our automated systems has also been raised to a higher level. Now, almost all ASU's have computer assistance in solving problems in the optimization of the planning and operational control of production.

Secondly, there has been significant development of the material and technical base for the production of computers, which are the basis of all ASU's. The creation of this base

contributed not only to a steady increase in computer production, but also to a substantial improvement in their technical level. An example of this is the third-generation, integrated-circuit computer used in the "Ryad" unified system. These computers are distinguished by their high operating speed and the development of an internal storage capacity and other high-quality characteristics. As a result, the overall capacity (and operating speed) of computers has begun to increase rapidly. In particular, during last year alone the capacity of the computers installed only in computer centers was increased by almost 25 percent. By "capacity" we mean the number of calculative operations per second.

The first conference contributed to the definition of the basic directions in the development of ASU's and the determination of the structure of automated systems. Considerable emphasis was given to the more rapid development of automated control systems for production processes [ASUTP].

The first conference's recommendations for the development of methodological principles for the further development of ASU's and measures for improving their economic effectiveness were of great value.

On the basis of a thorough analysis of the effects of modern technology, in February of this year we approved a new technique for determining the economic effectiveness of ASU's in enterprises and production associations. It makes it possible to obt in a more objective evaluation of the effect of ASU's on improvements in efficiency and quality.

The "Branchwide Methodological Guidance Materials for the Creation of ASUTP's in the Branches of Industry," which were developed under the leadership of the State Committee for Science and Technology, are of considerable importance.

[Question] How much development work has been done on ASUTP's?

[Answer] ASUTP's are now used extensively in enterprises in the most variegated branches of industry. Right now in this country, there are more than 1,000 automated control systems for complex production processes that use Soviet-made control computers. These systems are used in thermal, atomic, and hydraulic electric power stations and have found applications in the metallurgical, chemical, petroleum, gas, and other branches of industry. Almost twice as many ASUTP's will be put into operation during the Tenth Five-Year Plan than were during the last five-year plan.

Very much can be said about the effectiveness of ASUTP's. I will give you an example of this. Thanks to the use of ASUTP's at the Zyryanovskiy lead combine's concentrating plant, extraction of the basic elements from the ore was increased by 4 percent, the quality of the concentrates was improved considerably, and the volume of ore processed was increased by 5 percent. Besides this, the consumption of auxiliary materials was successfully reduced by 3 percent and labor productivity was improved by 66 percent. This equals a saving of the labor of 100 men.

[Question] What are the prospects for the introduction of ASUTP's in machine building. This is evidently the most complicated problem.

[Answer] The nature of machine-building production is extremely specific. However, we have a sufficient amount of significant experience in the use of ASU's for conveyors, testing tables, and groups of machine tools with digital programmed control. This makes it possible to accelerate the creation and expand the use of ASUTP's in machine building.

I would also like to mention the development of automated systems for controlling scientific research (ASNI). In particular, such systems make it possible to achieve a significant reduction in the amount of time needed for research projects, reduce the cost of performing experiments by 30-50 percent, and increase the productivity of labor in research and testing subunits by 50 percent.

[Question] Could you not tell us in more detail about the goals and purposes of the Second All-Union Conference?

[Answer] We approach this conference with considerable experience. We must discuss this experience thoroughly and find ways of eliminating several flaws, and then use this as a basis for accelerating the rates of introduction and increasing the scales on which computer technology is used in planning and control processes.

This second conference will be characterized by a discussion of the problems of a qualitatively new stage of computer development and the creation, using the computers as a base, of ASU's. On the basis of complicated integrated circuits, the production of which we have mastered, we now have the capability of creating and manufacturing computers with improved technical and economic characteristics and expanded functions.

We are in the process of mastering computers with high operating speeds ranging from a million to more than 100 million

operations per second. Along with the creation of powerful and ultrapowerful general-purpose computers, the production of control computers is also being successfully developed. Computers of this type should satisfy the need for systems for the automation of production processes and scientific and design work.

The creation of large integrated circuits made it possible to organize the production of so-called microcomputers. These miniature machines have all the properties of control computers. They will insure the widespread automation of production processes and the automation of conveyor lines, machine tools and machinery. This fact alone makes it necessary to discuss and solve a number of organizational, technical and programming problems.

At the conference, we intend to discuss the very important question of how to realize the decisions of the directing agencies on the use of computer technology in the processes of improving control and planning in the national economy.

Further, we plan to analyze the effectiveness of ways for improving the efficiency of public production through the use of computer technology. A wide circle of problems is related to the improvement of the system for the centralized supplying of ASU's and computer centers with computers, peripheral units and automation equipment.

It is extremely important to discuss the present state and prospects for the development of computer production and the centralized maintenance of computer facilities. An analysis of the practices used in introducing ASUTP's also deserves attention. The automation of processes in newly constructed and renovated facilities produces the greatest effect.

USSR Gosstroy, USSR Gosplan and the State Committee for Science and Technology established an order for the planning of technological objects that provides for the interrelated development of production equipment and ASUTP's within the framework of a unified, automated complex. This order is regulated by "Instructions for the Development of Projects and Estimated Costs for Industrial Construction" (SI-202-76), which was prepared by USSR Gosstroy. We have to admit that this order has already been frequently transgressed.

In our opinion, serious attention should be given to the further improvement of training for personnel involved in the planning and maintenance of computer centers and automated systems, with due consideration for the increasing complexity of the problems encountered and the introduction of new equipment.

We think that the Second All-Union Conference will have a significant effect on further increasing the economic effectiveness of ASU's in the national economy.

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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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INSTUTUTE PROGRESSES IN STANDARDIZING ASU'S FOR INDUSTRIAL PROCESSES

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1978 pp 1-4

[Article by Ye. P. Stefani, director of TsNIIKA and doctor of technical sciences, and V. I. Gritskov, candidate of technical sciences: "Ways to Improve Work Efficiency in Setting Up ASU's for Industrial Processes"]

[Text] In the Ninth and Tenth Five-Year Plans a large number of ASU's [automated control systems] for various kinds of industrial processes have been set up and are under development. The intensive growth in number and types of industrial [technological] objects of control and the increase in their capacity (productivity), complexity, quality requirements for carrying on the process, and the reduced time available to build them make it essential to step up the development of industrial methods of setting up ASU's for industrial processes.

This article is devoted to a consideration of ways to make the transition to the phase of industrial systems building. It is a formulated conception of the general scientific and production activity of TsNIIKA [State All-Union Central Scientific Research Institute of Comprehensive Automation] in Moscow in the area of setting up ASU's for industrial processes in the coming years.

During the Ninth Five-Year Plan TsNIIKA and its developers set up more than 100 ASU's for industrial processes,[1] including 30 large head systems. At the present time roughly 150-200 such head systems are needed for new sites alone in 15 subsectors of the national economy and this

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1 In this article the concept of ASU TP ["ASU tekhnologicheskim protsessom" — ASU for an industrial or technological process] is used in the broad sense and covers many systems that control industrial processes at all heirarchical levels, up to control of production at the enterprise level. The work of TsNIIKA on ASUP's [automated control systems for enterprises] is not taken up here.

need is rising. Among the head systems constructed on the basis of extensive use of the latest series-produced computer and automation equipment, mathematical models of industrial processes, and the modern methods of the theory of control of complex objects, we may take note of the Neft'-3 ASU for large primary petroleum refining installations and units, the Azot ASU for obtaining ammonia, the Polimir ASU for polyethylene, the Kompleks-ASVT and Kompleks-Uran ASU's for powerful thermal and atomic power units, the Kupol ASU for sulfuric acid production, the Kaskad ASU for chemical and petrochemical production, the Kristall ASU for the production of monocrystals, and the oxygen convertor shop ASU.

In the period 1974-1976, however, the contradiction between the needs of the purchasers of ASU's for industrial processes and the capabilities of TsNIIKA began to be acutely felt. For this reason the institute took a number of organizational and scientific-technical steps to improve the efficiency of work on setting up ASU's for industrial processes, specifically: new functional divisions were established which, together with existing ones, are assigned to develop hardware, software, and methodology for the ASU's for industrial processes; a scientific experimental center was formed and is operating successfully at the institute which makes models of the head systems and works out experimentally the technical and algorithmic structures of the ASU's being created; work has been begun at the institute and, under its direction, at other organizations and is going forward intensively to compile catalogs of modules of algorithms and programs; the first standardized technical designs for ASU's for industrial processes have been developed (for example, the Kupol-V for sulfuric acid production and the Neft'-1 for primary petroleum refining installations) and the systems have been circulated on this basis.

These steps were timely and effective, but they could not completely overcome the discrepancy between the need for ASU's and the capabilities of TsNIIKA. Radical measures were needed to sharply increase labor productivity at the institute in the area of setting up these ASU's, measures based on a thorough analysis.

During the Tenth Five-Year Plan the work of the TsNIIKA is developing in the following three main areas.

1. Development and practical utilization of new scientific principles and engineering methods of designing ASU's for industrial processes.

2. Setting up head models of highly efficient ASU's for industrial processes in thermal, atomic, and hydro power, ferrous and nonferrous metallurgy, chemistry, petrochemistry, and petroleum refining.

3. Development of standardized scientific-technical concepts as the foundation of the industrial method of designing and distributing ASU's for industrial processes.

Within the framework of these study areas the institute is continuing work on the development of equipment for remote control, pneumatic automation, and operational control and on problems of the reliability, metrology, and social and technical-economic efficiency of systems.

It is plain that these scientific-technical lines of work at TsNIIKA coincide in large part with the primary directions of work at other scientific research organizations of the Ministry of Instrument Making, Automation Equipment, and Control Systems that are developing ASU's.

The first area involves a continued expansion and deepening of theoretical research, extensive use of the capabilities of modern computer equipment (minicomputers and microcomputers), incorporating efficient methods of direct digital control of industrial processes, automating individual phases of research, design, and debugging work, building automated systems to generate ASU software, developing specialized data banks and packages of applied programs, and working out methods of insuring ASU reliability.

The special features of the work of TsNIIKA in setting up head ASU's for industrial processes during the Tenth Five-Year Plan are linked to the following important trends.

In the first place, the institute is focusing efforts on setting up head models of ASU's for industrial processes for modern, highly productive installations now under construction which will significantly surpass earlier ones in power and productivity. The use of progressive automation and computer equipment and the latest control methods at these installations will make it possible to obtain a greater economic effect. Among these objects we can note the 1,000 megawatt atomic power units, 1,200 megawatt thermal power units, 350-ton oxygen convertors for steel production, high-pressure polyethylene production units that produce 50,000 tons a year, primary petroleum refining units with capacities of 6 million tons a year and more, catalytic cracking units capable of up to 4 million tons a year, ammonia producing units with capacities up to 3,000 tons per 24 hours, sulfuric acid producing units with capacities up to 1,000 tons per 24 hours, and others. As a rule, the ASU's for industrial processes in these cases are being built alongside and reconciled with the units being automated.

In the second place, to conserve efforts and liquidate parallelism in this developmental work maximum use is being made of series-produced equipment and various standard concepts and the degree of standardization in the head ASU's for industrial processes being set up is taken as one of the key indexes of the merit of these developments.

In the third place, functional development of the ASU's is continuing, primarily by a vast increase in the scope of calculating, diagnostic, and control functions; in the near future the construction of pure information systems will no longer be the rule, it will be the exception. Alongside the development of systems theoretical and experimental

research is conducted on the control algorithms being set up with a physical model of the ASU at the scientific experimental center and a mathematical model at the computing center of the institute.

In the fourth place, a painstaking analysis of the functioning of existing systems to determine indexes of their precision, reliability, and economic efficiency as well as the social-psychological preparedness of operations personnel is becoming an essential part of the research that goes into creating head ASU's for industrial processes. These characteristics of the human-machine complexes are decisive and must be carefully worked out in all stages of system building. In particular, special attention is given to careful development of preliminary technical-economic substantiation jointly with customers in the initial stages of system building. Regular studies of the technical and economic efficiency of systems that have been introduced is considered very important.

Finally, in the fifth place, the head ASU's for industrial processes are being set up in such a way that it would be possible to use them and the standard concepts for them as the basis for development of standardized contract designs, in a very short time and with minimal expenditures, as the logical conclusion of virtually every head system.

The problem of switching to industrial methods of designing and distributing ASU's for industrial processes in different branches of industry makes it essential and pressing to carry out certain jobs aimed at substantially raising the level of standardization of these systems. For this reason TsNIIKA in 1977 began intensive development of standard concepts (SC's), systems of standard concepts (SSC's), and standardized contract designs (SCD's) as the foundations for standardizing ASU's for industrial processes.

The standard concept is a distinct and complete solution to one of the scientific-technical problems encountered in setting up ASU's for industrial processes which has been tested in practice and put in final form. Such SC's are designed for multiple use in the most diverse ASU's for industrial processes as standardized "parts" or building blocks. The SC's being developed must take account of the needs of modern control systems for complex industrial processes and the continuously improving base of means of automation and computer technology with respect to both hardware and software.

The scientific-technical level of SC's must be in line with the latest advances of theory and practice and offer a realistic possibility of industrial use within a few years. All SC's are subdivided into three groups: hardware for ASU's for industrial processes; mathematical (algorithm) and program support for ASU's for industrial processes; concerning methodological questions of setting up these ASU's.

Each SC has the form of a set of documents which establish the designation, area and conditions of use, description, and rules for use of the particular concept.

The system of standard concepts is a distinct, complete, and formalized (as a set of documents) mutually coordinated set of concepts for technical, mathematical, information, and organizational support of the ASU and a set of methodological instructions on procedures and rules for constructing an industrial process ASU designed to perform basic functions common to two or more variations of systems of the particular class.

A tentative classification of ASU's for industrial processes has been adopted to establish the boundaries of expedient application of each SSC. This classification is shown in the table below. It breaks all the systems being developed by the institute down into six classification groups using a limited number of basic features that characterize the industrial process as an object of control (for example, the first group is ASU's for installations with average information capacity and continuous processes; the sixth group is ASU's for shops and production works with continuous-discrete processes). The common functional, technical, and program-algorithmic structures of ASU's for industrial processes within the confines of each of these groups allow us to expect that it will be possible to build and efficiently use a single SSC.

Each SSC has the form of controlling technical materials, with a set of appendixes, which give the designation, description, and area, conditions, and rules of application of the particular SSC.

The system of standard concepts is the basic material for the development of either standardized contract designs for a group of ASU's for definite types of objects or for the contract design of a particular ASU with an expanded list of functions.

Unlike the standard concept, which should be applicable in the most diverse ASU's for industrial processes, each SSC is oriented to just one class of systems and represents a "standardized blank" for such systems.

The standardized contract design is a set of documents designed for multiple reproduction of the particular type of industrial process ASU (characterized by type and basic parameters of the industrial process) and containing all the basic scientific-technical and design concepts for such systems.

Therefore, the SCD's are a starting point, an efficient means, and a meaningful, realistic basis for beginning work to circulate ASU's for specific industrial processes. Creation of a systematically updated bank of SCD's at the institute will guarantee a broad front of action for the design and installation-debugging organizations of the

Classification of ASU's for industrial processes built by TsNIIKA,
Types of SSC's

(a) Уровень производственной иерархии	(d) Характер технологического процесса			
	(e) непрерывный, с условной информационной мощностью			(i) непрерывно-дискретный
	(f) средней (250—600 параметров)	(g) повышенной (600—1600 параметров)	(h) большой (свыше 1600 параметров)	
(b) Нижний (агрегаты, установки)	(j) **Группа 1. СТР-1** Примеры: АСУ ТП первичной нефтепереработки „Нефть-3". АСУ ТП получения крекинг-бензина „Октан", АСУ ТП производства серной кислоты „Вектор", АСУ ТП получения полистирола „Полистирол"	(k) **Группа 2. СТР-2** Примеры: АСУ ТП получения полиэтилена „Полимир", АСУ ТП получения аммиака „Азот"	(l) **Группа 3. СТР-3** Примеры: АСУ ТП тепловых энергоблоков „Комплекс-АСВТ", АСУ ТП атомных энергоблоков „Комплекс-Уран"	(m) **Группа 4. СТР-4** Примеры: АСУ доводкой стали мартеновской плавки „Процесс", АСУ выплавкой конвертерной стали „Конста"
(c) Средний и верхний (цехи, производства, заводы)	—	(n) **Группа 5. СТР-5** Примеры: АСУ химическим и нефтехимическим производством „Каскад", АСУ производством серной кислоты „Купол", АСУ производством специальной химии „Радикал", АСУ нефтеперерабатывающим производством „Нефть-5"		(o) **Группа 6. СТР-6** Примеры: АСУ мартеновским цехом, АСУ кислородно-конвертерным цехом, АСУ производством монокристаллов „Кристалл", АСУ горнообогатительным комбинатом

[Key on following page]

Key:
(a) Level of the Production Heirarchy;
(b) Lower (aggregates, units);
(c) Middle and Upper (shops, works, plants);
(d) Nature of the Industrial Process;
(e) Continuous, with Standard Information Capacity of;
(f) Medium (250-600 parameters);
(g) Increased (600-1,600 parameters);
(h) Large (more than 1,600 parameters);
(i) Continuous-Discrete;
(j) Group 1. SSC-1. Examples — Neft'-3 ASU for Primary Petroleum Refining;
Oktan ASU for Obtaining Gasoline by Cracking, the Vektor ASU for Sulfuric Acid Production, the Polistirol ASU for Obtaining Polystyrol;
(k) Group 2. SSC-2. Examples — Polymir ASU for Obtaining Polyethylene, Azot ASU for Obtaining Ammonia;
(1) Group 3. SSC-3. Examples — Kompleks-ASVT ASU for Thermal Power Units, the Kompleks-Uran ASU for Atomic Power Units;
(m) Group 4. SSC-4. Examples — Protsess ASU for Finishing Open-Hearth Steel, Konsta ASU for Smelting Convertor Steel;
(n) Group 5. SSC-5. Examples — Kaskad ASU for Chemical and Petrochemical Production, Kupol ASU for Sulfuric Acid Production, Radikal ASU for Special Chemical Production, and the Neft'-5 ASU for Petroleum Refining;
(o) Group 6. SSC-6. Examples — Open-Hearth Shop ASU, Oxygen Convertor Shop ASU, the Kristall ASU for Production of Monocrystals, and the ASU of a Mine Concentrating Combine.

Ministry of Instrument Making, Automation Equipment, and Control Systems and user sectors.

It is assumed that all work by TsNIIKA on standardization of ASU's for industrial processes will be closely interrelated and coordinated with the developers of specific head systems. In particular, SC's must be designed so that it is efficient to use them in SSC's, SCD's, and the contract designs of head ASU's for industrial processes. The development of SSC's and SCD's should, in turn, be done primarily on the basis of SC's and serve as a means to raise labor productivity in setting up the head systems. At the same time, the SC's, SSC's, and SCD's themselves must be developed with due regard for the results of analyzing and generalizing experience acquired in concrete systems projects. In the coming years catalogs of SC's and a series of SSC's and SCD's (along with specific head systems) should occupy a central place in the general flow of scientific-technical results of work by the institute in the field of ASU's for industrial processes.

Highly efficient work in setting up head ASU's and insuring extensive circulation of them with minimum time and financial expenditures are possible only where work at the institute is precisely organized and the institute cooperates closely with design and installation-debugging organizations and the plants which manufacture automation and computer equipment.

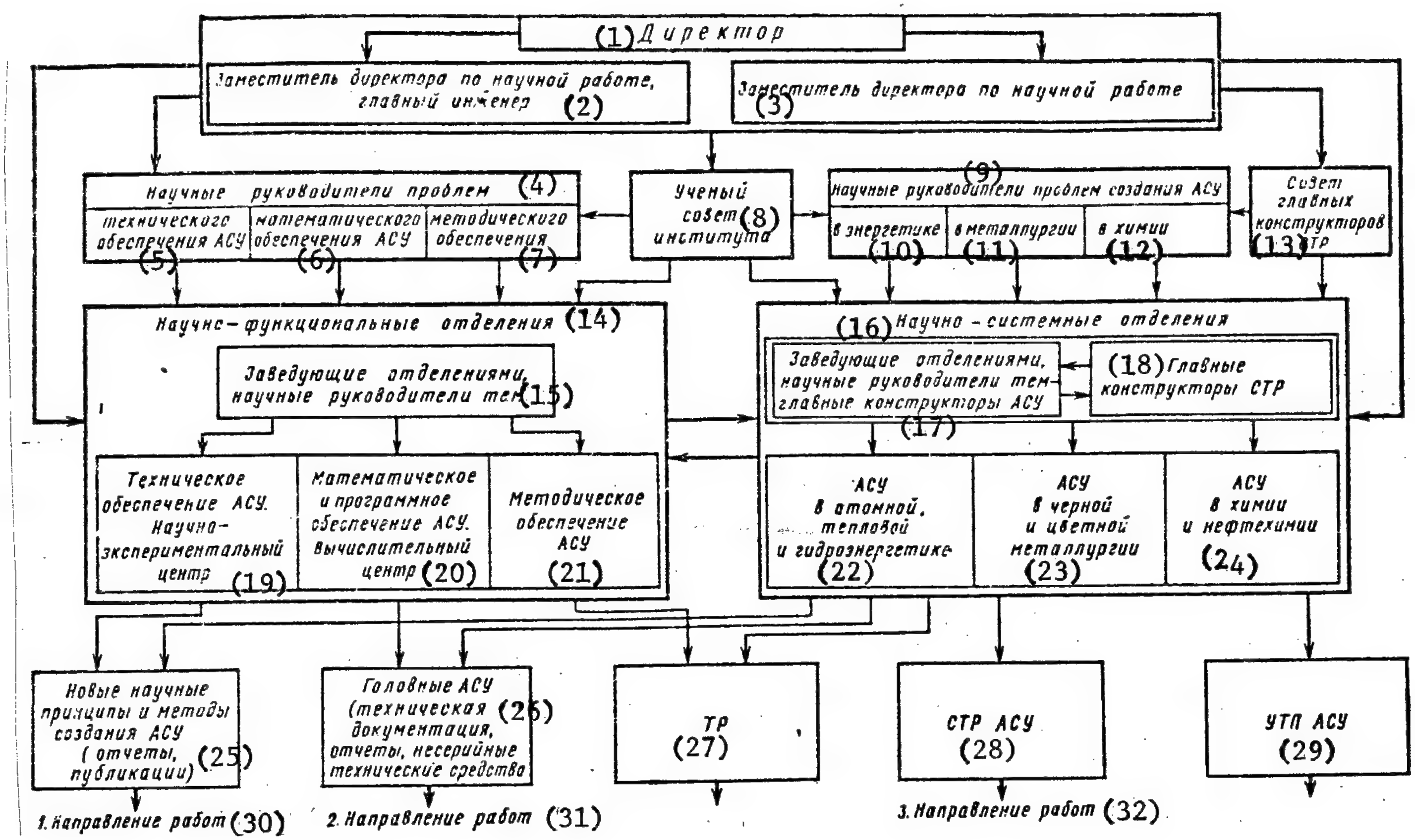
In our opinion, the structure of the science production work of TsNIIKA is optimal for efficiently building head ASU's and insuring their subsequent distribution. This structure is shown in Figure 1 below. Let us briefly consider certain features of this structure.

The head ASU's for industrial processes at sites in the power industry, metallurgy, and the chemical industry as well as SSC's and SCD's are being developed at TsNIIKA by scientific subdivisions specializing in systems with creative participation by functional scientific subdivisions under the leadership of chief ASU and SSC designers.

Scientific-technical coordination of the work of the systems divisions is the responsibility of the scientific directors of the problems of building ASU's in the power industry, metallurgy, and the chemical industry and the council of chief SSC designers. The scientific directors of problems are responsible for drawing up and meeting comprehensive plans for working out and developing ASU's in the given sectors.

The development and systematic elaboration of SC's for ASU hardware, software, and methodology is done at the institute primarily by the functional science subdivisions with creative participation by systems subdivisions. The functional scientific subdivisions write up catalogs (collections) of SC's which are regularly updated and supplemented. Extensive use of these catalogs permits a sharp increase in the labor productivity of ASU developers.

Figure 1.
Structure of the Scientific Production Activity of TsNIIKA in Building ASU's



[Key on following page]

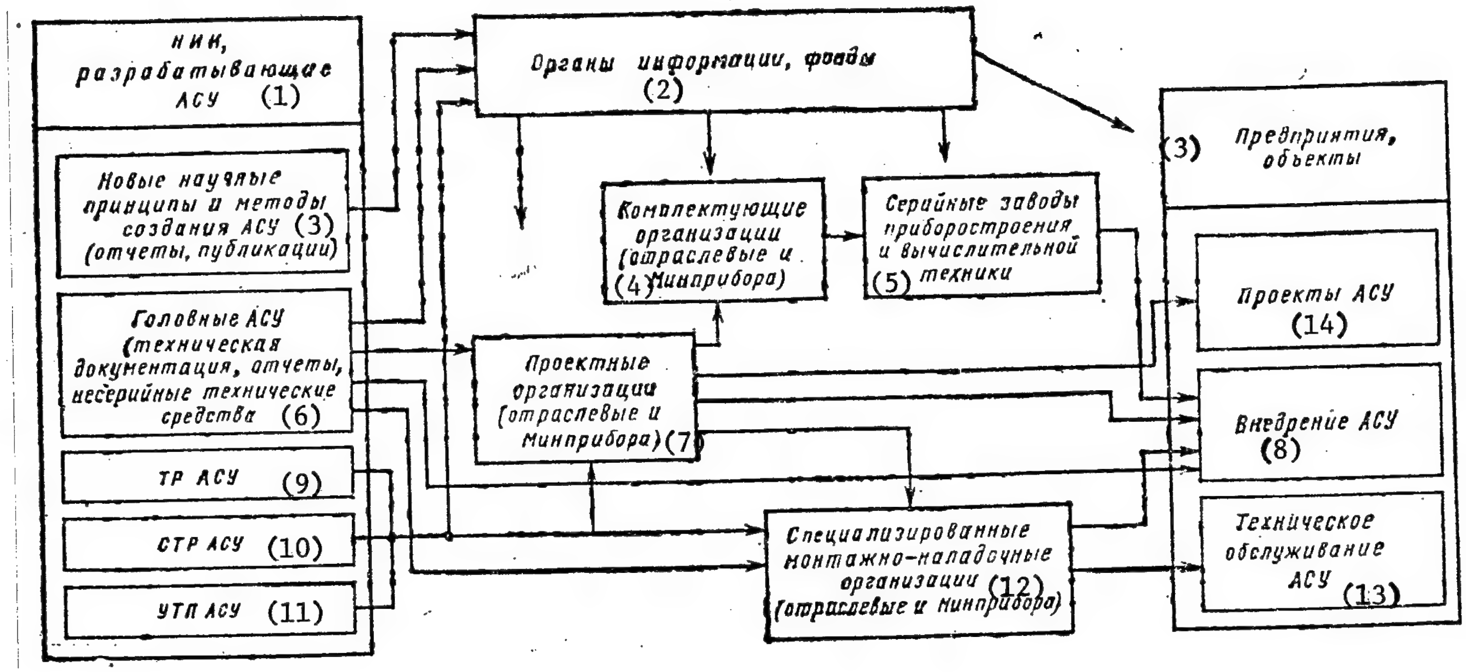
Key: (1) Director;
(2) Deputy Director for Scientific Work, Chief Engineer;
(3) Deputy Director for Scientific Work;
(4) Scientific Directors for Problems;
(5) ASU Hardware;
(6) ASU Software;
(7) Methodology;
(8) Institute Learned Council;
(9) Scientific Directors for Problems of Building the ASU's;
(10) In the Power Industry;
(11) In Metallurgy;
(12) In the Chemical Industry;
(13) Council of Main Designers of SSC's;
(14) Functional Scientific Divisions;
(15) Division Heads, Scientific Directors of Topics;
(16) Systems Scientific Divisions;
(17) Division Heads, Scientific Directors of Topics, Chief ASU Designers;
(18) Chief ASU Designers;
(19) ASU Hardware, Scientific Experiment Center;
(20) Mathematical and Program Support [software], Computing Center;
(21) Methodological Support for ASU;
(22) ASU's in Atomic, Thermal, and Hydro Power;
(23) ASU's in Ferrous and Nonferrous Metallurgy;
(24) ASU's in Chemistry and Petrochemistry;
(25) New Scientific Principles and Methods of Building ASU's (reports, publications);
(26) Head ASU's (technical documentation, reports, non-series technical equipment);
(27) Standard Concepts;
(28) ASU Systems of Standard Concepts;
(29) ASU Standard Contract Designs;
(30) First Area of Work;
(31) Second Area of Work;
(32) Third Area of Work.

Coordination of the work of the functional scientific divisions that include scientific experiment centers and computing centers is the responsibility of the scientific directors for the problems of ASU hardware, ASU mathematical and program support [software], methodology of building ASU's, and investigations of their technical-economic efficiency.

The general structure of relations between a scientific research institute that is developing head ASU's and the design, installation-debugging, and other organizations participating in building the head and distributing ASU's is represented in Figure 2 below.

Development of a head ASU is ordinarily assigned to a scientific research institute which, basing itself on technical specifications and working together with a design organization, works out a contract design of the system, its software, and various methodological materials, sponsors work in the detail design stage, and exercises scientific-technical guidance during debugging, testing, and turning the system over for use. As experience in recent years demonstrates, the total time required to build a system is reduced very significantly if the mathematician-programmers of the installation-debugging organization are involved in programming work as early as the detail design stage. But we must observe that at the moment when the contract design of the head system is released the planner and the plants which manufacture the basic equipment frequently are still unable to issue complete initial data for the development of algorithms and applied problems and, consequently, when the stage of detail design is completed the scientific research institute and installation-debugging organization have not managed to develop a full set of applied programs. Therefore, the system is usually turned over for operation in several stages during industrial testing, but it is mandatory that the first phase of the ASU, guaranteeing launching of the installation and its initial operation, be ready.

Figure 2. Structure of the Interaction of Organizations and Enterprises During the Building of Head ASU's and ASU's Distributed on Their Basis



[Key on following page]

Key: (1) Scientific Research Institutes That Are Developing ASU's;
(2) Information Agencies, Funds;
(3) New Scientific Principles and Methods of Building ASU's (reports and publications);
(4) Assembly Organizations (sectorial and belonging to the Ministry of Instrument Making, Automation Equipment, and Control Systems);
(5) Series Production Plants That Produce Instruments and Computer Equipment;
(6) Head ASU's (technical documentation, reports), Non-Series Produced Technical Equipment;
(7) Design Organizations (sectorial and belonging to the ministry);
(8) Introduction of the ASU;
(9) ASU Standard Concept;
(10) ASU System of Standard Concepts;
(11) ASU Standardized Contract Design;
(12) Specialized Installation-Debugging Organizations (sectorial and belonging to the ministry);
(13) ASU Technical Service;
(14) ASU Designs.

The entire set of jobs involved in building distributed ASU's and turning them over for operation is carried out by design and installation-debugging organizations of the Ministry of Instrument Making, Automation Equipment, and Control Systems or the purchaser's sector with the methodological assistance of the scientific research institute that developed the head system. In order to perform this work successfully these organizations must have at least a contract design of the head system and reports on results of its industrial testing, including methodological materials and documents on changes made in the process of building the system. The efficiency of work to distribute ASU's increases sharply, in our opinion, if the design organization carries out the detail design work on the basis not just of the contract design of the head ASU but also appropriate SSC's or SCD's. The most effective thing is for an SCD to be worked out by the design and scientific research organizations together.

Overall, the collective of TsNIIKA does not view the set of jobs involved in standardizing ASU's for industrial processes, including the development of standard concepts, systems of standard concepts, and standard contract designs, to be a temporary measure called for by passing circumstances. The institute believes that this is the chief area of activity for it in making the transition to industrial methods of building industrial ASU's.

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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

UDC 389:62-50:681.3

PROGRESS REPORTED IN STANDARDIZATION OF ASU COMPONENTS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1978 pp 8-11

[Article by I. A. Almazov, chief of the Administration of Instrument Making, Automation Equipment, and Control Systems of the USSR State Committee for Standards: "Standardization in Raising the Use Efficiency of ASU's and Computer Technology:]

[Text] Widespread use of ASU's [automated control systems] in our country's national economy has become an everyday thing. The success of the work of enterprises, associations, and even sectors often depends on their precise, uninterrupted functioning. Standardization is an important means to raising the efficiency of the development and use of various kinds of ASU's at different levels of control. By no means all computing centers have reached established standards for use of machine time. In our opinion, one of the reasons for this, along with flaws in the organization of the computing process, is the fact that the builders of computer technology by no means always insure high quality and operating reliability in all units. Therefore, steadily raising the quality, reliability, and technical-operating indexes of computer equipment is one of the key challenges today. This challenge must be met through the combined efforts of the producers and users of computer technology.

Consistent implementation of the principles of standardization of computer technology and ASU's should also have a significant effect in guaranteeing the compatibility of the hardware and software of computer machines and data processing systems.

Three basic areas can be identified in raising the quality of computer technology:

1. Creating new standards and during the process of revising existing technical standards introducing heightened requirements appropriate to the current scientific-technical level and user needs;

2. Improving the quality and reliability of computing machines and devices and certifying them with the State Mark of Quality;

3. Exercising state supervision of the observance of standards and technical specifications in computer technology during its development, production, and operation.

Work on standardization of computer technology at the state level was begun in practice in our country only after 1965. Today more than 100 state standards for ASU's and computing and office equipment have been developed and ratified. These standards cover questions of organizing the building of ASU's, requirements for hardware used in the ASU's, and machine information carriers. In addition, standards have been developed and ratified for alphanumeric codes for computer machines and data transmission equipment. Following these codes makes possible combined use of data transmission equipment and computers without code conversion in data processing systems. All of these groups of standards give maximum consideration to the requirements and indexes of the international standards of CEMA, the International Organization for Standardization, and International Electrotechnical Commission.

For a long time the country lacked a state standard for general technical requirements of computer technology. These requirements were developed and produced by organizations and enterprises of about 20 ministries and departments on the basis of different scientific-technical documents that established an uncalled-for diversity of requirements and standards. All this made for significant difficulties in building sets of hardware for ASU's and data processing systems.

Developers ran into a number of difficulties in creating a standard. The principal ones were the broad assortment of computer technology, differences among the developers, manufacturers, and users with respect to the approach to technical-operating characteristics of the computer technology, and the necessity of considering a large number of operative scientific-technical documents which often dictated contradictory requirements before establishing uniform requirements in a single document.

Therefore, the method of expert evaluation was used to overcome these conditions in creating the standard. This made it possible to have an objective determination of the parameters and requirements of computer technology that would improve their quality. When the draft standard was being worked out columns of possible values for standards and requirements were included for consideration and evaluation by the involved organizations and experts, first of all from the point of view of the problems and requirements that arise during designing, introducing, and operating computer technology, and secondly, from the point of view of the possibility of meeting each standard during the manufacture and delivery of the equipment.

During preparations to draft a standard for ratification these questionnaires with the evaluations of the experts were processed by a special algorithm. This made it possible to establish the requirements and standards made of computer technology more objectively.

As a result, State All-Union Standard 21552-76, entitled "Computer Technology," was ratified. It establishes general technical requirements for the manufacture, use, storage, and transportation of the technical equipment and power requirements. In addition, it sitpulates general requirements for information carriers, data formats, and the like.

The standard established uniform requirements for all computer technology, in particular with respect to resistance to climatic factors; service life, which was taken at least 10 years (formerly it had ranged from three to 12 years in different scientific-technical documents), power supply parameters (a voltage of 380/220 or 220 volts with a tolerance of -15 to +10 percent; tolerances had been different earlier); conditions for transportation and storage.

We believe that the introduction of this standard on 1 January 1979 will raise the quality of computer technology, serve as the basis for insuring the technical, information, program, and operating compatability of technical equipment, and make it possible to obtain a significant economic benefit in the national economy.

The standard which existed earlier did not consider a number of fundamental requirements that are essential in operating computers within an ASU. For this reason, the USSR State Committee for Standards commissioned the Ministry of Radio Industry to carry out a fundamental revision of the existing standard for computers, which resulted in the new State All-Union Standard 16325-65, entitled "General Purpose Electronic Digital Computers. General Technical Requirements," which establishes the general technical requirements for third-generation computers reflecting technical advances achieved in building them and taking account of the necessity of continued improvement in computers and insuring that they are compatible. The new standard was widely discussed in the industry. It was distributed to more than 500 enterprises and organizations for comment.

The basic difference between it and the old standard is that it establishes six classes of computers and their primary characteristics with respect to productivity, capacity of internal memory, and nomenclature of functions performed; requirements for software have been introduced; requirements for completeness of computer equipment, including software, have been stipulated; a methodology has been included for determining productivity and calculating the values of reliability indexes.

Using uniform standard concepts and insuring compatibility among systems at different levels are key factors in building and introducing ASU's. This can be accomplished by building a system of mutually reconciled state standards that constitute the organizational-technical foundation in building and introducing ASU's.

The following basic state standards have now been worked out in the ASU field: 19675-74 "ASU Basic Principles. Terms and Definitions;"

20914-75 "ASU. Design Stage. Content and Organization of Work"; 20912-75 "ASUP [Automated Control System for an Enterprise]. General Technical Requirements"; 16084-75 "ASU TP [ASU for an Industrial Process]. Basic Principles"; 20913-75 "ASU TP. Design Stages"; 17195-76 "ASU TP. General Technical Requirements"; 21705-76 "ASU TP Reliability. Basic Principles."

During 1977-1978 the following state standards are to be worked out: "ASU TP. Technical Specifications"; "ASU TP. Design Documentation. Types, Completeness, and Content of Documents and Procedures for Writing Them"; ASU TP. Signals and Interfaces. General Technical Requirements."

High requirements are made of control computers during the building and introduction of ASU TP's. The basic requirements are: high productivity while insuring control of the process in real time; availability of large internal and external memory volumes, which insures expansion of control functions and the scale of control; availability of an elaborate system of software compatible with computers at higher levels of control; increased machine reliability; modular construction which makes it possible to design and improve the ASU TP by stages, and others.

At the present time our industry produces third generation control computers and computing complexes in the series ASVT-M in conformity with State All-Union Standard 20397-74, entitled "The Aggregate System of Computer Technology Based on Microelectronic Circuits. General Technical Requirements."

The problem of standardization is equally important in the area of software for computing machines and data processing systems.

The lack of uniform organizational-technical and methodological principles during the design and introduction of present-day software systems leads to poor communication and duplication of work, precludes the use of programs developed earlier, and slows down the organization and use of centralized funds of algorithms and programs for the ASU's. Leading scientists and organizations in the country have been enlisted to solve this problem, specifically the Institute of Applied Mathematics of the Academy of Sciences USSR in Moscow, the Institute of Cybernetics of the Academy of Sciences Ukrainian SSR in Kiev, the Computing Center of Moscow State University, and others. As a result, for the first time in standardization practice in our country the USSR State Committee for Standards has ratified state standards for the algorithmic languages ALGAMS, COBOL, FORTRAN, and BASIC-FORTRAN.

In addition, the USSR State Committee for Standards ratified a series of standards of the Uniform System of Program Documentation developed by organizations of the Ministry of Radio Industry. These standards establish the general principles, stages of development, and

designations of programs and program documents and the types of programs and program documents. In 1978 eight more state standards of the Uniform System of Program Documentation are to be ratified.

The main distinguishing features of the development of work on standardization in the field of computer technology and ASU's during the Tenth Five-Year Plan are the comprehensive systems approach and formulating complexes of mutually reconciled technical standards documents which are the organizational-technical foundation for insuring technical, information, program, and operating compatibility in technical equipment and systems and promote effective economic and scientific-technical cooperation in the areas of the development, multifaceted specialization, and cooperative production of computer technology.

A great deal of work has begun within the CEMA framework on standardization of computer equipment and program documents; this will unquestionably raise the level of computer technology. Four comprehensive programs of standardization are planned with this objective for the period 1977-1985. They include the development of more than 100 standards for data processing systems and computers, YeS [Unified System] computers, and a program documentation system.

Certification for the State Mark of Quality is an important lever for raising the quality of computer technology.

The USSR State Committee for Standards carefully analyzes the decisions of certification commissions, going so far as to organize follow-up checks on the most important parts at the use sites.

State supervision of the observance of standards and technical specifications for computer technology by enterprises and organizations in the stages of design, testing, production, and use is an effective way to raise the technical level and quality of computer technology. When state supervisory agencies are carrying out such planned, comprehensive checks special attention should be given to the following questions: the current scientific-technical level of articles and steps to raise it; instances of producing poor-quality output at customer organizations and analysis of complaints by customers concerning computer technology; the correspondence between articles being produced and the requirements of technical standard documents (state and sectorial standards and technical specifications); complaints concerning the quality of assembly components and raw and processed materials.

If violations of state discipline are discovered at enterprises and organizations engaged in the development and production of computer technology firm steps are taken with them, going as far as imposing economic sanctions.

Uniform document systems and nationwide classifiers of technical-economic information are the basic components of ASU information support, especially when we are speaking of organizing mutual information

exchange among different national economic control systems at all levels. This makes the role and significance of uniform document systems and nationwide classifiers in building the unified nationwide system of data collection and processing for accounting, planning, and management very clear.

The USSR State Committee for Standards is working together with USSR Gosplan, the USSR Central Statistical Administration, and other ministries and departments on questions of ASU information support. This work is going forward in the following areas: creating a set of uniform document systems that encompasses the documents of virtually all central state administrative agencies (USSR Gosplan, the USSR Central Statistical Administration, USSR Gossnab, USSR Gosbank, and others); creating the Uniform System for Classification and Coding of Technical-Economic Information (YeSKK), which includes a set of national classifiers for natural, material, production, and labor resources and for other types of technical-economic information.

This work developed most extensively during the Ninth Five-Year Plan when, through the efforts of scientific research and design organizations of USSR ministries and departments, the appropriate technical standard documents were formulated and a number of organizational-technical steps were taken to introduce uniform document systems and nationwide classifiers of technical-economic information in practice in designing and operating ASU's at different levels. The results are as follows:

1. Thirteen uniform document systems, including state standards for the systems (a total of 38) and sets of standardized document forms appropriate to them (in all more than 1,700 forms), were composed for various types of activity in the national economy, including planning, supply, accounting, finance, price formation, trade, and others;

2. Nineteen national classifiers of technical-economic information were developed to cover the coding and processing of information on natural resources, industrial and agricultural output, national economic management, production and economic activity, labor resources, and other types of technical-economic information (at the present time the nationwide classifiers of technical-economic information contain more than 10 million positions). The USSR State Committee for Publishing Houses, Printing Plants, and the Book Trade, working with the USSR State Committee for Standards, the USSR Central Statistical Administration, and other ministries and departments, has now printed 15 nationwide classifiers and publication of the remaining ones is being completed;

3. Automated systems for managing nationwide classifiers have been turned over for use; these systems insure the reliability of

the information they contain by making ongoing changes and supplements and distributing them to the head organizations of the ministries and departments;

4. Systems for managing uniform document systems have been compiled which correct existing document forms and develop new standardized forms;

5. The ministries and departments have assigned and the USSR State Committee for Standards has ratified 124 head organizations which are managing and introducing the nationwide classifiers and uniform document systems in their sectors;

6. A set of technical standard, organizational, and methodological documents has been worked out on questions of the development, management, and introduction of uniform document systems and nationwide classifiers of technical-economic information to support the writing of these materials, the process of experimental and then universal introduction, and systems of subsequent checks on the application of uniform document systems and nationwide classifiers in ASU's.

Thirty-five documents have been prepared on these matters, including: coordination plans (programs) of work by ministries and departments to write, introduce, and then develop uniform document systems and nationwide classifiers of technical-economic information in the Ninth and Tenth five-year plans: "Primary Directions and Order of Work to Introduce Nationwide Classifiers of Technical-Economic Information and Uniform Document Systems of the First Phase and Work on Further Development of the Uniform System of Classification and Coding of Technical-Economic Information and Uniform Document Systems," ratified by the USSR State Committee for Science and Technology, USSR Gosplan, and the USSR State Committee for Standards; "General Methodological Instructions on the Introduction of Uniform Document Systems and Nationwide Classifiers of Technical-Information in ASU's"; instructions on state supervision and departmental control of the introduction of uniform document systems and nationwide classifiers in ASU's; instructions on state registration of classifiers, and others.

As a result of the theoretical and practical work done during the Ninth Five-Year Plan the general principles of application of nationwide, sectorial, republic, and enterprise classifiers were determined, namely: the codes of nationwide classifiers of technical-economic information must perform the function of identifiers of the objects of technical-economic information on a nationwide scale; the nationwide classifiers of technical-economic information serve as a nationwide go-between language during the exchange of information among ASU's of different spheres and levels; problems within the systems of ministries and departments may be solved using both nationwide classifiers and in-system ones, intersectorial, sectorial, republic, and enterprise classifiers. When exchanging information with ASU's

external to the given one it is necessary to use appropriate recoding tables from the language of in-system classifiers to the language of the nationwide classifiers and vice versa.

As a result of work on formulating uniform document systems the composition of these systems has been defined, interdepartmental documents have been standardized, and the types of documents have been classified by creation of the Nationwide Classifier of Administrative Documents (OKUD).

The following basic principles of compiling uniform document forms have been established: standardization of requirements for uniform document forms; classification of types of documents with due regard for the tasks of the functional subsystems of the ASU; regulation of requirements for composing document forms on the basis of model forms that are standard for each type of document and requirements for essential contents; standardization of the forms of standard documents on the basis of a design network that considers the possibilities of modern office machinery; designing documents for processing by computer technology.

Scientific development and organizational measures created the prerequisites for universal introduction of uniform data systems and nationwide classifiers of technical-economic information in ASU's. At the present time 350 organizations have completed experimental introduction work. This will make it possible to carry out the necessary corrections in the uniform document systems and nationwide classifiers by making changes and additions using the functioning management systems for the nationwide classifiers and uniform document systems. The next step is universal introduction of the uniform document systems and the nationwide classifiers of technical-economic information; this is supposed to be completed in the Tenth Five-Year Plan at operating ASU's and those being built.

In December 1976 a meeting of the Interdepartmental Council on Questions of Improving Control in the National Economy was held. The meeting reviewed questions of the introduction and further development of uniform document systems and nationwide classifiers of technical-economic information. The council basically approved of the work done and recommended that ministries and departments introduce the uniform document systems and nationwide classifiers in their ASU's during the Tenth Five-Year Plan as the basis of information interaction and subsequent creation of the uniform state system of data collection and processing.

A definite economic benefit should be expected from the introduction of uniform document systems and nationwide classifiers of technical-economic information. The creation of local systems of classifiers and document forms for different levels of ASU's in each ministry or department, while making it possible to solve problems of ASU functioning on a sectorial scale, will not resolve the main problem of coordinating the work of the ASU's through mutual exchange of information on a nationwide scale.

Preliminary calculations of the average annual economic effect from introduction of nationwide classifiers of technical-economic information only show that it could be 8 million rubles; considering expenditures to compile the nationwide classifiers this allows us to expect repayment of the Uniform System of Classification and Coding of Technical-Economic Information in about three years. The country can receive an even greater economic benefit from composing uniform document forms.

Further development of uniform document systems and the Uniform System of Classification and Coding of Technical-Economic Information is envisioned during the Tenth Five-Year Plan by composing two new uniform document systems and nine nationwide classifiers of technical-economic information.

In 1978 state supervisory territorial agencies of the USSR State Committee for Standards (including oblast agencies) will begin exercising state supervision over introduction of uniform document systems and nationwide classifiers of technical-economic information in ASU's. During this process they will also help organizations and enterprises in this important work.

In conformity with the decree of the Executive Committee of CEMA, the USSR State Committee for Standards and USSR ministries and departments are working toward formulation of the General Classifier of Industrial and Agricultural Output of the CEMA countries (OKP SEV) on the basis of the USSR output classifier. Such a classifier will further deepen and refine cooperation, facilitate mutual deliveries, and promote socialist economic integration of the CEMA countries.

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RIGA MEETING VIEWS GENERAL PROGRESS IN MICROPROCESSORS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1978 pp 61-62

[Article signed "Organizing Committee": "The Second All-Union Meeting on Microprocessors"]

[Text] The Second All-Union Meeting on Microprocessors was held in Riga in October 1977. The meeting was organized by the Scientific Council on the Comprehensive Problem of Cybernetics of the Presidium of the Academy of Sciences USSR, the Scientific Council on Automation of Scientific Research and Problems of Cybernetics of the Presidium of the Academy of Sciences Latvian SSR, and the Institute of Electronics and Computer Equipment of the Academy of Sciences Latvian SSR. The meeting aroused great interest among representatives of various fields of science and technology and 350 people from more than 200 organizations in the country participated.

The meeting was opened by M. L. Raman, candidate of technical sciences and chairman of the Latvian SSR Gosplan. In his speech he stressed the important role which computer equipment, including microprocessors, is going to play in accomplishing the main tasks set by the 25th party congress: raising the efficiency of socialist production by every means. The report of Academician of the Academy of Sciences Latvian SSR E. A. Yakubaytis and candidate of technical sciences A. K. Baums entitled "Advances and Problems of Microprocessors," which was given at the first plenary session, presented an analysis of the development of microprocessors in the two years that had passed since the first meeting in September 1975. The extraordinarily rapid progress in this area was noted and prospects for further development were considered.

The second plenary report, "The Unified Family of BIS [Large Integrated Circuit] Microprocessor Sets for Computer Technology (YeS MP)," which was read by candidate of technical sciences V. A. Grinkevich on behalf of a large group of authors, considered the general principles that are the foundation for development of the standardized element base for general-use fourth generation computer equipment.

The primary work of the meeting took place in three sections.

The first section, entitled "Microprocessor Systems," was dedicated to general questions of building microprocessors and families of them, developing computers on the basis of microprocessors, and organizing multimicroprocessor systems. Forty-two reports were given at the section; the reports on procedures for switching computer technology to large integrated circuits aroused the greatest interest. In their talks V. A. Grinkevich, A. K. Golovan, V. M. Antonov, O. B. Makarevich, and M. A. Kocharov noted that choosing the functional composition of large integrated circuits is a complex task and simply switching existing circuits to integrated technology is inefficient. The way out of this situation is to produce a standardized element base in the form of sets of large integrated circuits in which each circuit is a specialized processor module. The reports by A. K. Golovan and Yu. M. Ivanchenko reviewed possibilities of using microprocessors to construct the central processors of large Unified System computers. T. V. Masyukova discussed the interesting features of the process of building typical minicomputers on the basis of microprocessor large integrated circuits.

Substantial attention was also given to the architecture of the microprocessors themselves and the module sets based on them (the reports by R. A. Nikanorov, N. S. Polonskaya, Yu. A. Yarantsev, and others), as well as organizing multimicroprocessor systems (the reports by V. I. Antonov, A. I. Sapozhkov, and others). Numerous reports reviewed new methods of making microprocessor systems. D. A. Strabykin suggested constructing microprocessors on the basis of integrated memory modules, while O. G. Kokayev proposed a base of associative memory and V. F. Nesteruk suggested cylindrical magnetic domains. The need to develop specialized microprocessors to solve particular classes of problems was also noted. For example A. M. Oranskiy proposed a computer module for navigation problems, V. Ye. Zolotovskiy suggested a microprocessor and multimicroprocessor system to solve equations of partial derivatives, V. N. Skorik offered multimicroprocessor structures for solving problems of mathematical physics, and O. B. Makarevich suggested the structure of a microprocessor that accomplishes step-by-step conveyor processing of data on the basis of extrapolation formulas of numerical integration.

The second section, entitled "Development and Programming," also heard 42 reports. They were devoted to techniques of developing the microprocessors themselves and various systems based on them. Questions of programming received the greatest attention. A. K. Teslenko reviewed the general composition of the software of microprocessor systems and the controlling monitor program for the programmable controller. A. V. Linde investigated the possibility of constructing a meta-assembler suitable to handle the assembler languages of different microprocessors. G. I. Ivanov discussed the organization of a library of general-purpose programs that make it easier to compose the software of discrete control units based on microprocessors. A. S. Shyusha suggested the use of the

mathematical apparatus of difference equations for analytic description of the algorithms of microprocessor functioning.

Automated design systems, which also include means of modeling microprocessors on large general-purpose computers, play an important role in the development of discrete units based on microprocessors. A. N. Krapchin and T. V. Grishanina analyzed the changes which must be made in systems for designing digital parts when microprocessor large integrated circuits are used. The reports by V. F. Gusev, A. P. Zamorin, and V. A. Grinkevich considered questions of automated designing of systems constructed on the basis of the YeS MP. M. S. Kupriyanov proposed a standardized efficiency factor that makes it possible to choose the family of microprocessor large integrated circuits for a particular unit and a technique for automated development of models of the functioning of such systems.

Microprocessor large integrated circuits are very complex devices and therefore significant attention at the section was devoted to questions of their development and analysis. The report by V. K. Popolutov proposed a method of local detailization that makes it possible to check whether the logical circuit of a microprocessor large integrated circuit is functioning correctly. A technique for modeling malfunctions of microprocessor large integrated circuits which provides an analysis of the coverage of the system of tests was given in the report by A. B. Svyatskiy. A. L. Gurtovtsev considered a formalized synthesis of logical units by the decomposition method according to which circuits that meet the requirements of contemporary circuit engineering are constructed. A. L. Lantsov and M. A. Rakov noted the advisability of using a multivalue structural alphabet in microprocessors and described base circuits that make it possible to construct quite complex systems. S. I. Yusifov presented a method for designing microprocessors with several operating units.

Programmable logical matrices (PLM's) are an important component of modern microprocessor families. The survey report by G. F. Frintsovich reviewed problems of synthesizing finite automata on PLM's, Ye. A. Babkin and A. P. Tipikin spoke of realizing them on the base of logical processors, and Ye. L. Denisenko presented a technique for designing the control unit of a microcomputer on the basis of PLM's. Yu. A. Gobzemis reviewed the structural statement method of technical diagnosis of PLM's.

The reports devoted to methods of debugging and monitoring microprocessor systems aroused great interest. V. Ya. Simkhes passed along experience in developing equipment for automated monitoring of the large integrated circuits of the YeS MP. The fact that microprocessors handle numerous functions often makes it possible to use large integrated circuits that do not fully satisfy the requirements of technical specifications. This leads to the necessity of classifying microprocessor large integrated circuits by function. Ways to solve this problem were suggested by N. G. Sabadash.

The third section, entitled "The Application of Microprocessors," heard and discussed 39 reports. The subject matter of the reports was broken into four groups and a separate session was devoted to each.

Questions of the use of microprocessors to process signals were considered at the first session. These widely recognized problems (spectral conversions, discrete Fourier transform, signal recognition, and others) are comparatively difficult to solve with existing equipment. The use of multimicroprocessor systems permits more efficient solutions. The report by V. A. Dmitriyenko and associates, which reviewed questions of generalized spectral conversions, aroused special interest.

The application of microprocessors in control units for peripheral equipment makes it possible to improve all their technical characteristics. The reports heard at the second session reviewed programmable controllers and adapters for magnetic discs, display terminals, alphanumeric printers, monitoring and measuring equipment, and the like.

The third session was devoted to the use of microprocessors in communication systems and in transportation. O. D. Polosatkin discussed a control unit for a telegraph printer based on a microprocessor, A. N. Berlin reported on a microprocessor control system for a small telephone subscriber exchange, and Yu. I. Torgov spoke of the application of microprocessors in the display equipment of an automated control system for air traffic.

The final session was devoted to the use of microprocessors in control systems for industrial equipment. The communications by A. L. Simakov and Ye. P. Balashov concerning the use of microprocessors in digital programmed control systems aroused the greatest interest. Units for communication with the object are an important part of systems of direct digital control. V. Ya. Zagurskiy and D. K. Zibin' reviewed input-output channels for analog and relay signals that have extensive functional capabilities.

In general the work of the session showed that the use of microprocessors makes it possible to efficiently solve a number of complex scientific-technical problems, substantially improve the technical characteristics of discrete units, and sharply cut equipment design time.

The resolution adopted by the meeting points to the need for closer cooperation among the different organizations engaged in the development, manufacture, and application of microprocessors.

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NEW BOOKS ON COMPUTER HARDWARE, SYSTEMS REVIEWED

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1978 p 64

[Reviews: "New Books"]

[Excerpts] Miroshnik,I.A., and Pirogov,A.I. "Metody Izmereniya Impul'snykh Kharakteristik Malogabaritnykh Magnitnykh Serdechnikov" [Methods of Measuring the Pulse Characteristics of Small Magnetic Cores], Moscow, Energiya, 1977, 96 pages, 6,500 copies, price — 34 kopecks (Automation Library, No 574).

Methods and principles of constructing equipment for testing and measuring the dynamic characteristics and parameters of small magnetic cores. Characteristics of the construction of magnetizing pulse generators and measurement of the parameters of the pulses of voltages arising in the process of magnetization. Measuring instruments and devices designed to analyze and test magnetic cores.

For scientific workers and engineers specializing in the development and application of automation and computer technology.

Mova, V. V., Ponomarenko, L. A., and Kalinovskiy, A. M., "Organizatsiya Prioritetnogo Obsluzhivaniya v ASU" [The Organization of Priority Service in ASU's], Kiev, Tekhnika, 1977, 160 pages, 8,000 copies, 72 kopecks.

Methods of determining the optimal order of processing information flows in ASU's by means of computer technology and using these methods in different automated systems. A data processing technology calculated to improve the technical-operating indexes of computers and raise the efficiency of their use. Concrete examples of analyzing and calculating the parameters of situation control.

Parfenov, O. D., "Tekhnologiya Mikroskhem" [Microcircuit Technology], Moscow, Vysshaya Shkola, 1977, 256 pages, 20,000 copies, 66 kopecs (textbook for higher educational institutions in the specializations "Electronic Computer Machines" and "Design and Production of Electronic Computer Equipment").

The technology of semiconductor integrated microcircuits (diffusion, epitaxy, passivation, interconnections, and photolithography). The technology of hybrid film microcircuits (thermal vacuum dusting, monitoring thin-film elements in the dusting process, dusting by ion bombardment, technological characteristics of thin-film microcircuits). Assembling microcircuits (installation-assembly operations, securing supports and crystals, sealing).

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NEW BOOK DISCUSSES USE OF AUTOMATED CONTROL SYSTEMS

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 4,1978 pp 142-145

[Review by R. Migachev of the book "Razvitiye Avtomatizirovannykh Sistem Upravleniya v Promyshlennosti" [Development of Automated Control Systems in Industry] by Yu.P. Lapshin, Izdatel'stvo Ekonomika, Moscow, 1977, 271 pages]

[Text] Yu.P. Lapshin's book is the first work to correlate the more than 10 years' experience that has been accumulated in the creation of automated control systems (ASU). It is well written and easy to read. The detailed presentation of material on the development of ASU's in industry and the explication of the results of introducing computer technology (and its effectiveness) during the Ninth Five-Year Plan should be regarded as particularly valuable.

The comparative analysis of the development of ASU's in different branches of the national economy, the comparison of expenditures for the creation of ASU's at different levels of control, and the temporal dynamics of the computer pool, all of which are based on extensive materials, give the reader an idea about the paths and tendencies followed in the development of ASU's.

These factual materials on the introduction of ASU's in industry are published in such concentrated form for the first time, so the book will serve as a reference book for a wide circle of specialists.

As a rule, the numerous works on the problems of ASU's that have been printed reflect the experiences of different developers and do not make it possible to compare the qualitative and quantitative level of the development work and introduction processes that take place in different branches. However, having objectively evaluated and compared the nature and level of the control systems that have been introduced in different

branches in past years, the author is able to formulate the most effective paths for further work on the creation of ASU's.

The materials presented in this book clearly show a trend toward increasing the percentage of computers installed in enterprises (9 percent in 1968 and 65 percent in 1973) and an increase in the proportion of machine time spent on processing economic information. During this period, the proportionate time spent on engineering and technical calculations decreased from 75 to 52.9 percent, while the volume of economic information processing rose from 23.7 to 43.9 percent. Some of the quantitative evaluations may be taken as approximate. For instance, some authors include one or several output forms in their definitions, while others include entire classes of the production and economic activities of enterprises and organizations. Since Lapshin does not his own definition of the categories he uses, it is difficult either to agree with the structure presented by him (75 percent for accounting and statistical operations, 20-24 percent for planning, and 1-5 percent for optimization work) or to argue with it (see page 31).

During his comparative analysis of the dynamics of expenditures for technical facilities and their effect on operating expenses (using the example of first-, second- and third-generation computers), the author predicts a trend toward a reduction in expenditures per unit of installed capacity and changes in the structure of operating expenses. Unfortunately, general-purpose computers were left out of this comparison. It is a well-known fact that they are informationally, technically and programmingly incompatible with other computers. Such an analysis would make it possible to focus attention on the fact that (for third-generation computers) this problem is still an unsolved one (for the programmingly and technically incompatible M-6000 and YeS series of computers, in particular). It is also possible to mention the M-4030 computer, which is compatible with both the M-6000 and YeS computers, as this is of special value for integrated systems. The figures characterizing the reduction in expenditures for equipment from 60 to 48 percent and the increase in the proportion of expenditures for software from 10 to 20 percent are interesting. They agree with the book's critical analysis of the development of both systemwide and applied software and the experience gained in developing ASU's.

In our opinion, when the author talks about a reduction in operating expenses he fails to take into consideration one of the most important trends in the use of terminals: their installation in places where information is generated (warehouses, bookkeeping offices, dispatching points, and so on), which will

make it possible to combine the formulation of documents with their simultaneous registration on a machine carrier.

A matter of both scientific and practical interest is the method for classifying planning projects for the introduction of computer technology, based on the informational characteristics of the controlled objects, that is presented in Chapter 2. In combination with a method for classifying projects by technical and economic parameters (the method of the USSR Academy of Sciences' Central Economics and Mathematics Institute), it made it possible for the branch ministries to approach the determination of the primary objects of ASU introduction on a well-founded basis.

The economic advisability of creating ASU's for different groups of objects was determined on the basis of a comparison of the branch's normative efficiency coefficient and the capital investments for the introduction of computer technology, which was a key factor in the State's policy for the development of automated systems. This approach took into consideration the state and preparedness of different branches for a changeover to control methods using ASU's.

There is both practical and theoretical interest in methods for planning the economic effectiveness of the use of computer technology that allow for the time lapse between the completion of expenditures for capital investments and the initial economic effect, as well as the stage-by-stage nature of the increase in annual savings caused by the introduction of ASU's.

The formulas for determining the annual volume of the savings and the planned economic effectiveness of capital investments for the introduction of computer technology over an extended period of time are presented in a form that is convenient for practical use. They make it possible to determine the sequence with which planned ASU's should be supplied with computer technology on a quite well-founded basis.

In the author's opinion, when discussing questions relating to the effectiveness of ASU's it is advisable to use differentiated calculative indicators that allow for the degree of computer technology utilization by introducing in the plan's section on "Profits and Production Costs" a subsection entitled "Due to the Use of ASU's," where the reduction in expenses per ruble of commodity production is shown in calculative form. In the section on "Production Capacities," it is suggested that a calculative indicator of the increase in capacities be included when an ASUTP [automated production process control system] is put into operation. These proposals on the part of the author

cause no objections, although their realization entails great difficulties. In particular, the effect of ASUTP's (as a source of primary information for an ASUP [automated planning control system]) in integrated systems can be manifested in the sphere of organizational and economic control. In this case, it is a very complicated matter to determine the effect of ASUTP's on an increase in production capacities. Besides this, the introduction of both ASUTP's and an ASUP have an indirect effect that is expressed in an improvement in work safety and the creation of comfortable working conditions, which cannot be expressed in terms of the indicators "increase in capacity" or "increase in profit."

Thus, in general the economic effect is achieved through both the factors that produce a direct effect (and can be calculated) and those necessary for the production process that cannot be computed directly upon introduction.

When speaking of territorial collective-use computer centers (VTsKP), Lapshin is not sufficiently clear when he shows the trends for the development of interrelationships between VTsKP's and consumers and does not define the recommended form and type of services offered to the consumer. He suggests the development of a tariff scale that determines the scale of the assignments to the VTsKP's profit on the basis of the actual savings to the consumer. However, there exists a significant class of problems for which it is extremely complicated to calculate the actual savings achieved by their solution.

It is obvious that it is necessary to assign part of the profit to the total savings obtained by the solution of an entire complex of problems for a given customer, and not to the solution of individual problems (particularly in integrated systems). In the case where only individual problems are solved and a direct savings is obtained, it is possible to agree with the author.

The description of techniques for developing 5-year and current plans for introducing computer technology that is given in Chapter 3 will be of considerable interest to specialists in different branches of the national economy.

The author's conclusion about the necessity of increasing expenditures for the production and introduction of peripheral equipment is also correct. Analyzing the state of planning for the introduction of computer technology and substantiating his recommendations for improving it, the author adheres to the idea of the necessity of coordinating plans for production and the introduction of computer technology. Starting from just

these considerations, the author develops recommendations for the joint use of the YeS-1022 and YeS-1033 computers that are based, on the one hand, on an analysis of the necessary computer capabilities and, on the other hand, on the capacities for industrial production of computers.

In his explanation of the material in the book, the authors employs the concept of economic organizational and production organizational systems, although the differences between them are not adequately clear. In addition, it is not understandable why optimum planning and control should apply to some special form of ASU. Any type of planning is a function of an economic organizational ASU. Realization of the planning goals, monitoring the values of the planned indicators, and control over the deviations in the latter are all accomplished with the help of operational dispatching control and ASUTP's.

In Chapter 2 (Table 8.2), Lapshin presents an ASUTP classification that is based on the number of controlled parameters. The author's attempt to establish a rigid relationship between the number of controlled parameters and the class of a system seems to be extremely debatable.

When selecting a third-generation computer, along with the volume of information to be processed and technical and economic indicators it is advisable to take into consideration the processing regimes (block, time sharing, on a real-time scale) that are needed. It is a well-known fact that at the present time it is difficult -- and frequently impossible -- to organize the operation of a computer in several modes. When the processing regime is taken into consideration a larger number of computers will probably be required (primarily at the lower processing levels) because of their specialization, but this still does not mean that the system's cost will increase. Computer specialization reduces the number of aggregate modules. Unfortunately, there have been instances where an M-6000 computer has been ordered in the ninth configuration (the cheapest), in an attempt to organize block processing with it, although it is more rational to work block problems on a central computer.

The book's second chapter is devoted to the organizational forms of the utilization of computer technology in controlling the national economy. In this chapter the author formulates the basic questions of the general concept of the development of the General State System for the Collection and Processing of Information (OGAS) for recording, planning and controlling the national economy, its functions, composition and levels of control, and the basic directions for its creation. In

connection with this, the characteristic features of the development of each of the control levels are delineated.

In Chapter 5, Lapshin discusses the structure of the OGAS, which is built on the hierarchical principle and includes four levels of information processing.

On the lowest level, information on the production and economic activities of enterprises and organizations is processed. The author correctly focuses attention on the creation of the initial ASU's at large industrial, transportation, construction, and agricultural enterprises. In industry, up to 70 percent of the fixed capital is concentrated in such enterprises, while the share of the industrial production volume is more than 75 percent of the total volume of production in this country.

The creation of local ASU's by leading enterprises, with the connection of small and medium-sized ones to them without considering their administrative subordination, must become a future tendency in this work.

The author discusses the urgent question of the creation of VTsKP's and the organizational and legal forms of their interrelationships with their customers.

When examining the second level of OGAS control, Lapshin uses specific examples to show the advisability of concentrating computer facilities, with due consideration for the specific nature and character of the information that the customer has to be processed and the creation of interdepartmental computer centers. In connection with this, one of the basic factors that must be considered is unified initial information and unified classifiers and coders.

For local industry and municipal services, the author substantiates the need for research on the creation of experimental ASU's for a small group of enterprises.

On the whole, this book explains in detail the organization of data processing systems in agriculture, transportation, construction, and local industry and municipal services.

The components of the third level of control are branch, departmental and republic ASU's. The practices used in creating them in a number of branches shows that the greatest effectiveness is achieved where this work is correlated with measures for improving the control process (in the coal industry, for example).

In Chapter 7 -- "ASU's for Associations and Enterprises" -- the author correctly points out the need for expanding the use of type planning solutions (TPR).

However, the planning of the utilization of TPR's must be preceded by a large amount of preparatory work in each branch. For instance, in mining branches, which are characterized by specific control conditions for certain groups of enterprises (primarily in the area of controlling basic production), it is necessary to do further work on the classification of control objects after grouping them (or individual elements of them) by similarity of the production process. Work must also be done on standardizing the operational systems, applied program packets, data banks, and programming languages used in the branches. Classification and standardization will make it possible to calculate the possibilities for circulating TPR's more accurately and to predict the expense of ASUP development. This also applies to integrated ASUP's.

In Section 7.3, which is devoted to the creation of integrated ASUP's, the author does not reflect the need for insuring the compatibility of low-level minicomputers with the central computers.

One would think that in connection with the transition to integrated control systems, someone should formulate the question of the forms of association of the work of the planning and design and scientific research organizations that are developing the software and information support for these systems, as well as the correlation of the standardized elements of the system's complex of facilities. At the present time -- as a rule -- ASU's for different levels are created independently, and attempts to link them up are made only at the introduction stage. However, the development of sensors that match the installations and other automation equipment with each other should be maintained in specialized organizations that work from the specifications of the general designers of the integrated systems. The existing disjointedness interferes with the new level of creation of such systems.

The author convincingly formulates the principles of the information support, hardware and software for OGAS, OASU, ASUP's, and ASUTP's, including such new organizational forms as integrated ASU's. This is another important advantage of the book, particularly if we consider the significant differences in the definition of the boundaries and goals of different organizational forms for the utilization of computer technology in controlling the national economy.

From our point of view, this book should be regarded as not only timely, but also extremely necessary for both those people who are concerned with questions of the development and introduction of ASU's and the wide circle of economic leaders who are, undoubtedly, already faced to some extent with the solution of this extremely important Statewide problem.

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TENTH CONGRESS OF THE UKRAINIAN PHYSIOLOGICAL SOCIETY IMENI I. P. PAVLOV

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian No 2, 1978 pp 277-279

[Article by M. F. Shuba]

[Text] The Tenth Congress of the Ukrainian Physiological Society, which was held in Odessa on 26-30 September 1977, took place on the eve of the 60th anniversary of the Great October Socialist Revolution. Participating in it were 260 delegates from 17 cities of the republic: Kiev, Khar'kov, Odessa, Dnepropetrovsk, Donetsk, L'vov, Vinnitsa, Chernovtsy, Ivano-Frankovska, Voroshilovgrad, Ternopol', Zaporozh'ye, Simferopol', Poltava, Uman', Cherkassy and Uzhgorod.

Heard and discussed at plenary sessions of the congress were the reports of the chairman of the Central Council of the Ukrainian Physiological Society (UPS), Academician P. G. Kostyuk, on the status and prospects of development of physiological science in the Ukrainian SSR, the report of Corresponding Member of the AS Ukrainian SSR P. G. Bogach, Professor N. I. Putilin and Professor R. O. Faytel'berg on the state and paths of improvement of the teaching of physiology in VUZ's of the republic, and also reports on the work of the Central Council of the UPS (Professor M. F. Shuba) and the auditing commission (Professor B. Ye. Yesipenko). At 16 symposiums more than 60 reports were heard and discussed, and more than 300 reports on various problems of physiology were presented on stands.

The work program of the congress was compiled in such a way that all the participants in the congress had the possibility of speaking at sessions of the symposiums or reporting their data in the form of stand reports. This made it possible for all present to become acquainted with investigations now being conducted on physiology in the republic and of discussing the results of those investigations in detail.

Symposiums of the congress were devoted to the following main problems of contemporary physiology:
1. Mechanisms of excitability.
2. Neurohumoral regulation of ontogenesis.

3. Mathematical modeling of physiological processes.
4. Physiological principles of increase of the productivity of agricultural animals.
5. Thalamic mechanism of integrative activity of the brain.
6. Mechanisms of regulation of vascular tonus and hemodynamics.
7. Hormonal regulation of physiological functions.
8. Absorption in the gastrointestinal tract.
9. Hypothalamic mechanisms of neurohormonal regulation.
10. Regulation of respiration.
11. Physiology of subcortical structures of the forebrain.
12. Physiological problems in increasing the efficiency of labor.
13. Limbic-neocortical interrelations
14. Regulation of cardiac activity.
15. Cellular mechanisms of the activity of secretory glands and smooth muscles of the digestive tract.
16. Physiology of the higher nervous activity of man and animals.

Mere listing of the titles of the symposiums testifies that at the present time intensive investigations are being conducted in the republic in almost all sections of the physiology of man and animals. In volume and scientific significance the results of those investigations merit being discussed at special symposiums.

Deserving of special attention are symposiums devoted to practical and special questions of the physiology of man, and also the physiology of agricultural animals. This also is understandable, for in our time, a time of rapid development of all spheres of human activity, it is extremely important to know the physiological principles of the conditions of work and rest of man. Without that knowledge there can be no discussion of the effectiveness and quality of the work of man, on the one hand, and of his health, on the other.

As analysis of plans and reports presented to the congress has shown, themes relating to economic contracts occupy a large place in investigations of physiologists of the republic. Such themes have a dual value for, firstly, they make it possible to obtain additional financial resources for those conducting them and, secondly, purchasing organizations are interested in the very rapid practical introduction of the results of those investigations, which in turn considerably stimulates the expansion of physiological investigations of an applied character.

The congress showed that a general feature of the development of physiological science in the past period has been a considerable increase of the volume and depth of scientific investigations and a penetration into the essence of very complex physiological processes.

Those successes of physiology became possible thanks to the use of the latest achievements of physics and chemistry, which have armed physiological science with a number of precise methods permitting the study of the basic processes of vital activity on the cellular and subcellular levels, including molecular and membrane mechanisms of the principal neural processes, the physiology of neurons and synapse, the functional role of various brain structures, and also the principles of the processing and transmission of information in them.

Physiologists of the Ukrainian SSR have made a weighty contribution to the development of these and other urgent questions of physiological science. At the present time the UPS includes 15 local departments and the total membership of the society amounts to 1241. In the republic scientific research work is being done on the main problems of physiology in 72 institutions, including three specialized institutes of physiology -- the Institute of Physiology imeni A. A. Bogomolets of the AS Ukrainian SSR, the Institute of Physiology of Kiev University imeni T. G. Shevchenko and the Ukrainian Institute of the Physiology and Biochemistry of Agricultural Animals (L'vov), in 10 departments of the physiology of man and animals and universities, 14 departments of normal physiology of medical institutes, and 22 departments of anatomy and physiology or zoology (with physiology) of pedagogical institutes.

In addition to that, research on physiology is done in the sections and laboratories of a number of specialized institutes, such as the Institute of Cybernetics of the AS Ukrainian SSR, the Institute of Gerontology of the AS Ukrainian SSR, the Institute of Endocrinology of the Ministry of Public Health Ukrainian SSR, the Institute of Clinical Medicine of the Ministry of Public Health Ukrainian SSR, the Institute of Medical Problems of Physical Culture of the Ministry of Public Health Ukrainian SSR and a number of other institutions.

In all in the Ukrainian SSR 1500 persons are engaged in scientific research work in physiology. Two journals are published regularly -- FIZIOLOGICHESKIY ZHURNAL and NEYROFIZIOLOGIYA. About ten monographs and collections and over 200 articles are published each year.

Important results have been obtained by Ukrainian physiologists in solving problems of the physiology of the nervous system, neurophysiology and neurochemistry, higher nervous activity, the perception, transmission and processing of information in sensory systems, the control and organization of activity of the visceral systems; the phsyiological, biochemical and structural principles of the evolution of functions, the physiological mechanisms of the adaptation of man and animals to environmental conditions, the physiological principles of the vital activity of man and the physiology and biochemistry of agricultural animals.

The physiologists of the Ukraine occupy a leading place in the Soviet Union in a number of directions (physiological aspects of molecular biology, the physiology of membranes, neurophysiology, the physiology of hypoxic states and age physiology).

The preparation of highly qualified physiologists is proceeding successfully. However, the congress noted that a number of urgent physiological problems are still being insufficiently worked out (questions of the physiology of man, of sensory systems, especially the physiology of vision, of bioenergetics and the physiology of development).

The theoretical and methodical levels of research are not identical: thus, whereas investigations on the physiology of membranes, neurophysiology and

the physiology of smooth muscles are being conducted on a high level, in some areas of the physiology of digestion, respiration and the physiology of man, due to an absence of suitable equipment, the level of research is somewhat below the all-union level.

In a number of institute departments the development of research work on physiology is held back by a lack of modern laboratory equipment, and also by the heavy educational load of scientific workers of those departments.

The congress considered that further development of the principal directions of physiological science is needed to solve problems of the national economy of the republic -- of industry, agriculture, public health and sports. In the long-term plans for the next decade it is necessary to provide for more intensive study of the physiology of man, including study of it during various processes of labor and extreme states. The expansion of research on the physiology of labor and on underwater and space physiology must find reflection.

It is necessary to expand investigations of questions of the nutrition of agricultural animals, metabolism, development and the search for conditions contributing to intensification of protein accumulation. Along with those practical questions, investigations must be expanded on membrane physiology, synaptology (fundamental research done in that direction can be of great practical importance in industry, in clarifying the pathogenesis of a number of neural and psychic diseases and in assuring rational therapy, in particular, by means of neutron devices). It is also necessary to contribute in every possible way to the expansion of work on the physiology of visceral systems (blood circulation, digestion and respiration); the results of those investigations are needed by practical medicine, sport, etc.

To perform all the enumerated tasks it is necessary first to improve the quality and effectiveness of physiological scientific investigations. This is possible if physiological institutions are re-equipped with modern equipment and the qualifications of scientific personnel are further increased, and also if the conditions of scientific work in the VUZ departments are improved by reducing the educational load. It is necessary to provide for the planning of the educational load in physiology in the VUZ's, especially in the medical VUZ's, in order to increase the efficiency of mastering physiological knowledge.

To eliminate ineffective subjects and duplication it is necessary to create conditions for the effective coordination of scientific research on problems on the part of scientific problem councils and interdepartmental coordination commissions.

More attention must be given to the creation of programs with a clearly formulated task which assures a complex approach to the solution of the posed questions.

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